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Who's Not Coming to Dinner? Evaluating Trends in Online Restaurant Reservations for Outbreak Surveillance

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Objective

The objective of this study is to evaluate whether trends in online restaurant table reservations can be used as an early indicator for a disease outbreak.

Introduction

Epidemiologists, public health agencies and scientists increasingly augment traditional surveillance systems with alternative data sources such as, digital surveillance systems utilizing news reports and social media, over-the-counter medication sales, and school absenteeism. Similar to school absenteeism, an increase in reservation cancellations could serve as an early indicator of social disruption including a major public health event. In this study, we evaluated whether a rise in restaurant table availabilities could be associated with an increase in disease incidence.

Methods

We monitored table availability using OpenTable; an online restaurant table reservation site for cities in the USA and Mexico. Our analysis can be summarized as follows. First, using the OpenTable site, we searched for the number of restaurants with available tables for two persons at lunch and dinner. Since different regions and individuals have different eating habits, we defined the lunch period between 12-3:30pm and dinner between 6-10:30pm. We searched for available tables every hour and half past the hour for every day of the week. Next, we investigated any occurrences of social unrest and natural disasters, which might have affected the trend in the time series. Lastly, using moving averages, cross-correlations and regression models, we elucidated and compared the time-trend in the data of table availabilities to data collected for various disease outbreaks. In the USA, we examined table availability for restaurants in Boston, Atlanta, Baltimore and Miami. For Mexico, we studied table availabilities in Cancun, Mexico City, Puebla, Monterrey, and Guadalajara.

Results

Preliminary results indicated differences in mean table availabilities observed during weekdays and weekends. However, these differences were statistically significant only for Boston and Miami ($p < 0.01$). Statistical significant differences were also observed for mean table availabilities at lunch and dinner for all the cities ($p < 0.001$).

Conclusions

The unavailability of reasons for cancellations introduces limitations to this data source. However, monitoring increases in cancellation of restaurant table reservations may be moderately useful for detecting epidemics especially in developing countries with limited public health infrastructures and resources. We therefore present a framework for future surveillance efforts.

Keywords

developing countries; infectious diseases; alternative data sources; reservation sites

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